



Relating increasing hantavirus incidences to the changing climate: The mast connection

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Abstract:

BACKGROUND: Nephropathia epidemica (NE), an emerging rodent-borne viral disease, has become the most important cause of infectious acute renal failure in Belgium, with sharp increases in incidence occurring for more than a decade. Bank voles are the rodent reservoir of the responsible hantavirus and are known to display cyclic population peaks. We tried to relate these peaks to the cyclic NE outbreaks observed since 1993. Our hypothesis was that the ecological causal connection was the staple food source for voles, being seeds of deciduous broad-leaf trees, commonly called "mast". We also examined whether past temperature and precipitation preceding "mast years" were statistically linked to these NE outbreaks. **RESULTS:** Since 1993, each NE peak is immediately preceded by a mast year, resulting in significantly higher NE case numbers during these peaks (Spearman R Euro Surveillance (Bulletin European Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) -0.82; P Euro Surveillance (Bulletin European Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.034). NE peaks are significantly related to warmer autumns the year before (R Euro Surveillance (Bulletin European Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.51; $P < 0.001$), hotter summers two years before (R Euro Surveillance (Bulletin European Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.32; $P < 0.001$), but also to colder (R Euro Surveillance (Bulletin European Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) -0.25; $P < 0.01$) and more moist summers (R Euro Surveillance (Bulletin European Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.39; $P < 0.001$) three years before. Summer correlations were even more pronounced, when only July was singled out as the most representative summer month. **CONCLUSION:** NE peaks in year 0 are induced by abundant mast formation in year-1, facilitating bank vole survival during winter, thus putting the local human population at risk from the spring onwards of year 0. This bank vole survival is further promoted by higher autumn temperatures in year-1, whereas mast formation itself is primed by higher summer temperatures in year-2. Both summer and autumn temperatures have been rising to significantly higher levels during recent years, explaining the virtually continuous epidemic state since 2005 of a zoonosis, considered rare until recently. Moreover, in 2007 a NE peak and an abundant mast formation occurred for the first time within the same year, thus forecasting yet another record NE incidence for 2008. We therefore predict that with the anticipated climate changes due to global warming, NE might become a highly endemic disease in Belgium and surrounding countries.

Source: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2642778>

Resource Description

Climate Change and Human Health Literature Portal

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Meteorological Factors, Precipitation, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Belgium

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Zoonotic Disease

Zoonotic Disease: Hantavirus Pulmonary Syndrome

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified